

WHAT IS CLAIMED IS:

1. An exposure apparatus to be used with an excimer laser as a light source, said apparatus comprising:

5 an optical system disposed along a path of excimer laser light;

a chamber for accommodating said optical system therein and having an inside space being able to be replaced by a predetermined gas;

10 a gas circulation mechanism having a gas discharging port for discharging a gas from said chamber and a gas supply port for supplying a gas into said chamber; and

15 switching means for selectively using plural purifiers disposed in a portion of a gas circulation path.

2. An apparatus according to Claim 1, wherein said purifiers are disposed in parallel to each other, 20 in a portion of the gas circulation path.

25 3. An apparatus according to Claim 1, further comprising a switching valve for selectively flowing the gas to either upstream or downstream of said purifiers, and for selectively flowing the gas to any one of said purifiers.

4. An apparatus according to Claim 3, wherein
said valve is operable to shut the gas flow to at
least one purifier.

5 5. An apparatus according to Claim 4, wherein
said valve is operable to shut the gas flow to a
purifier which is to be replaced by another or
maintenance of which is to be done.

10 6. An apparatus according to Claim 3, wherein
said valve is operable in response to a signal from a
control system.

15 7. An apparatus according to Claim 1, further
comprising a gas supply source for supplying a gas to
said purifier, and a gas discharging mechanism for
discharging gas from said purifier.

20 8. An apparatus according to Claim 7, wherein,
on the basis of said switching means, a gas from said
gas supply source is supplied to said purifier to
which no gas is supplied from said chamber, and
wherein, on the basis of said gas discharging
mechanism, the gas is discharged from said purifier.

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9. An apparatus according to Claim 7, further
comprising a second valve for opening and closing a

flowpassage between said gas supply source and said purifier.

10. An apparatus according to Claim 7, wherein
5 said gas supply source supplies an inactive gas to
said purifier.

11. An apparatus according to Claim 10, wherein
the inactive gas is one of helium and nitrogen.

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12. An apparatus according to Claim 7, wherein
the supply of gas from said gas supply source is
performed after the replacement of said purifier or
the maintenance thereof.

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13. An apparatus according to Claim 7, wherein
introduction of a gas of said chamber to said purifier
is initiated in accordance with one of a gas flowing
time of said gas supply source and an output of a gas
20 detector.

14. An apparatus according to Claim 1, further
comprising a bypass way for circulating the gas inside
said chamber, without passing through said purifier.

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15. An apparatus according to Claim 14, further
comprising a third valve for changing flowpassages to

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said bypass way and said purifier.

16. An apparatus according to Claim 14, wherein
said bypass way is used at least when said apparatus
5 is started.

17. An apparatus according to Claim 1, wherein
the gas from said purifier is supplied to a supply
port while being temperature controlled.

10 18. An apparatus according to Claim 1, wherein
said purifier has a function for removing oxygen.

15 19. An apparatus according to Claim 1, wherein
said purifier has a function for removing ozones.

20 20. An apparatus according to Claim 1, wherein
said purifier has a chemical filter.

20 21. An apparatus according to Claim 20, wherein
said chemical filter is effective to remove an organic
gas.

25 22. An exposure apparatus to be used with an
excimer laser as a light source, said apparatus
comprising:

first and second chambers for maintaining a

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predetermined gas ambience at a path of excimer laser light; and

an optical member for spatially separating said first and second chambers from each other, and
5 being transmissive to the excimer laser light;

wherein said optical member contains fluorine compound glass.

23. An apparatus according to Claim 22, wherein
10 said first chamber has an optical integrator.

24. An apparatus according to Claim 23, further comprising a half mirror disposed between said optical integrator and said fluorine compound glass, wherein
15 light reflected by said half mirror is detected to determine the light quantity.

25. An apparatus according to Claim 22, wherein said second chamber is adapted to enclose a masking
20 blade for defining an illumination range on a reticle.

26. An apparatus according to Claim 22, wherein the fluorine compound glass uses one of CaF_2 , MgF_2 , SrF_2 and fluorine doped quartz.

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27. An apparatus according to Claim 22, wherein one of F_2 laser and Ar_2 laser is used as the light

source.

28. An apparatus according to Claim 22, wherein
said first and second chambers are controlled to
5 different ambiences, respectively.

29. An apparatus according to Claim 28, wherein
the ambiences inside said first and second chambers
are controlled at different oxygen concentrations.

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30. An apparatus according to Claim 28, wherein
one of said first and second chambers is controlled to
a helium ambience, and wherein the other is controlled
to a nitrogen ambience.

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31. An apparatus according to Claim 22, wherein
said first and second chambers enclose an optical
element for forming an illumination optical system,
and wherein said first chamber is disposed at the
20 light source side while said second chamber is
disposed at the projection optical system side.

32. An apparatus according to Claim 22, wherein,
in said first chamber, an inactive gas is supplied
25 thereinto from a gas supply port provided at one end
of said first chamber while the inactive gas is
discharged from a gas discharging port provided at the

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other end of said first chamber, such that inside said first chamber the gas flows along the light path.

33. An apparatus according to Claim 22, wherein,
5 in said second chamber, an inactive gas is supplied
thereinto from a gas supply port provided at one end
of said second chamber while the inactive gas is
discharged from a gas discharging port provided at the
other end of said second chamber, such that inside
10 said first chamber the gas flows along the light path.

34. An apparatus according to Claim 22, further
comprising a third chamber for enclosing at least one
of said first and second chambers.

15 35. An apparatus according to Claim 34, further
comprising temperature adjusting means for supplying a
temperature controlled gas to said third chamber.

20 36. An apparatus according to Claim 34, wherein a
gas of a purity lower than that of the gas supplied to
said first and second chambers is supplied to said
third chamber.

25 37. An apparatus according to Claim 34, wherein a
gas discharged from at least one of said first and
second chambers is supplied to said third chamber.

38. An apparatus according to Claim 34, wherein
helium is supplied to at least one of said first and
second chambers, and wherein nitrogen is supplied to
5 said third chamber.

39. An exposure apparatus to be used with an
excimer laser as a light source, said apparatus
comprising:

10 first and second chambers for maintaining a
predetermined gas ambience at a path of excimer laser
light; and

15 a movable member for connecting said first
and second chambers with each other, to secure gas
tightness and to enable absorption of relative
displacement between said first and second chambers.

40. An apparatus according to Claim 39, further
comprising a gas discharging mechanism for providing a
20 reduced pressure ambience in said chamber.

41. An apparatus according to Claim 39, wherein
the inside ambience of said chamber is replaced by an
inactive gas.

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42. An apparatus according to Claim 39, wherein,
after the reduced pressure ambience is produced in

said chamber by said gas discharging mechanism, an inactive gas is supplied into said chamber and, then, a reduced pressure ambience is produced therein again by said gas discharging means.

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43. An apparatus according to Claim 39, wherein said movable member comprises a bellows.

44. An exposure apparatus for use with an
10 excimer laser as a light source, said apparatus comprising:

an optical system having plural optical elements and a reflection member for deflecting light; and

15 gas supplying means for supplying a gas to a space separated by optical elements of said optical system;

wherein, in a space where said reflection member is present, a line connecting a vent hole for
20 supplying a gas to the space and a vent hole for discharging the gas from the space intersects an optical axis of the optical elements separating the space, as viewed from a direction orthogonal to the optical axis.

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45. An apparatus according to Claim 44, wherein the vent holes are provided so that the line

connecting the vent holes in the space intersects, twice, a portion of the optical axis being bent.

46. An apparatus according to Claim 44, wherein
5 said gas is an inactive gas.

47. An apparatus according to Claim 44, wherein
the inactive gas is one of nitrogen gas and helium
gas.

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48. An apparatus according to Claim 44, wherein
the light source emits light of a wavelength in a
vacuum ultraviolet region.

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49. An apparatus according to Claim 44, wherein
the light source comprises one of F₂ laser and Ar₂
laser.

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50. An apparatus according to Claim 44, wherein
said optical system is at least one of an illumination
optical system and a projection optical system.

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51. An apparatus according to Claim 42, wherein
said optical system includes one of a catadioptric
system and a catoptric system.

52. A device manufacturing method, comprising the

steps of:

preparing an exposure apparatus as recited in
any one of Claims 1, 22, 39 and 44;

5 applying a photosensitive material to a
wafer;

exposing the wafer by use of the exposure
apparatus; and

developing the exposed wafer.

10 53. A semiconductor manufacturing factory,
comprising:

a production machine group including an
exposure apparatus as recited in any one of Claims 1,
22, 39 and 44;

15 a local area network for connecting the
production machine group; and

a gateway for enabling access from the local
area network to an external network outside said
factory;

20 wherein information related to at least one
production machine in said production machine group is
data communicated.

25 54. A maintenance method for an exposure
apparatus as recited in any one of Claims 1, 22, 39
and 44 and being placed in a semiconductor
manufacturing factory, said method comprising the

steps of:

preparing a maintenance database connected to
an outside network of the factory, wherein the
database can be prepared by a user or a vendor of the
exposure apparatus;

admitting access to the maintenance database
through the outside network, from the factory; and

transmitting maintenance information stored
in the maintenance database to the factory through the
outside network.

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